Patent Claims

1. Dental material containing a cluster according to the general formula

$$[(M^1)_a(M^2)_bO_c(OH)_d(OR)_e(L\text{-}Sp\text{-}Z)_f] \quad (I)$$

in which

M^1, M^2	independently of each other, stand for a metal atom of the IIIrd or Vth main groups or the Ist to VIIIth sub-groups of the periodic table;
R	is an alkyl group with 1 to 6 carbon atoms;
L	is a co-ordinating group with 2 to 6 complexing centres;
Sp	is a spacer group or is absent;
Z	is a polymerizable group;
a	is a number from 1 to 20;
b	is a number from 0 to 10;
c	is a number from 1 to 30;
d, e	independently of each other, are in each case a number from 0 to 30;
f	is a number from 2 to 30,

any charge of the cluster (I) present being equalized by counterions.

2. Dental material according to claim 2, **characterized in that** the variables have the following meanings:

M^1, M^2	=	independently of each other, Ti and/or Zr;
R	=	an alkyl group with 1 to 4 carbon atoms, in particular 1 to 2 carbon atoms;
L	=	α-hydroxycarboxylate ($-CH(OH)-COO^-$),

α-aminocarboxylate ($-CH(NH_2)-COO^-$), β-diketonate ($[-C(-O^-)=CH-C(=O)R^K]$; with R^K = alkyl, preferably C_1 to C_6 alkyl, particularly preferably C_1 to C_3 alkyl, in particular methyl, sulfonate ($-SO_3^-$) or phosphonate ($-PO_3^{2-}$), particularly preferably carboxylate ($-COO^-$);

Sp = an alkylene group with 1 to 18 arbon atoms, an oxyalkylene group with 1 to 18 carbon atoms and 0 to 6 oxygen atoms or an arylene group with 6 to 14 carbon atoms, the spacer Sp being able to contain one or more, preferably 0 to 2 of the groups O, S, CO-O, O-CO, CO-NH, NH-CO, O-CO-NH, NH-CO-O and NH; particularly preferably, Sp is an alkylene group with 1 to 6, in particular 1 to 3 carbon atoms or is absent;

Z = an ethylenically unsaturated group, an epoxide, oxetane, vinyl ether, 1,3-dioxolane, spiroorthoester, particularly preferably a methacrylic and/or acrylic group;

a = 2 to 11;

b = 0 to 4.

3. Dental material according to claim 2 or 3, **characterized in that** L-Sp-Z stands for acrylate, methacrylate, oleate, allyl acetoacetate and/or acetoacetoxyethyl methacrylate.

4. Dental material according to one of claims 2 to 4, **characterized in that** the clusters 1 to 4 contain kinds of ligands of the type L-Sp-Z.

5. Dental material according to one of claims 2 to 5, **characterized in that** the cluster has a monodisperse mass distribution.

6. Dental material according to claim 2 or 6, **characterized in that** the indices c to f assume values such that the positive charges of the metal or metals are completely equalized.

7. Dental material according to one of claims 2 to 7, **characterized in that** M^1 is equal to M^2.

8. Dental material according to one of claims 2 to 8, **characterized in that** it contains one or more further polymerizable components.

9. Dental material according to claim 9, **characterized in that** the further polymerizable component is a polymerizable polysiloxane, an ionically and/or radically polymerizable organic monomer or a mixture thereof.

10. Dental material according to one of claims 2 to 10, **characterized in that** it contains an initiator for ionic and/or radical polymerization, filler and/or further additives.

11. Dental material according to one of the previous claims, **characterized in that** it contains, relative to its overall mass

(a) 5 to 90% wt.-% of at least one cluster according to formula (I),

(b) 10 to 90 wt.-% of a further polymerizable component,

(c) 0.1 to 5.0 wt.-% polymerization initiator,

and

(d) 0 to 90 wt.-% wt.-% filler.

12. Use of a cluster of the general formula

$$[(M^1)_a(M^2)_bO_c(OH)_d(OR)_e(L\text{-}Sp\text{-}Z)_f] \quad (I)$$

in which

M^1, M^2	independently of each other, stand for a metal atom of the IIIrd or Vth main groups or the Ist to VIIIth sub-groups of the periodic table;
R	is an alkyl group with 1 to 6 carbon atoms;
L	is a co-ordinating group with 2 to 6 complexing centres;
Sp	is a spacer group or is absent;
Z	is a polymerizable group;
a	is a number from 1 to 20;
b	is a number from 0 to 10;
c	is a number from 1 to 30;
d, e	independently of each other, are in each case a number from 0 to 30;
f	is a number from 2 to 30,

any charge of the cluster (I) present being equalized by counterions, as dental material or for the preparation of a dental material.

13. Use according to claim 12 as adhesive, coating material, cement or filling material.